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Syllabus of lectures
on the Laws of heredity and
principles of breeding x x x x



SYLLABUS OF LECTURES
ON THE
LAWS OF HEREDITY
AND
Principles of Breeding.

GIVEN AT THE SHEFFIELD SCIENTIFIC SCHOOL OF YALE COLLEGE,
TO STUDENTS IN THE COURSES IN AGRICULTURE AND IN
BIOLOGY, JANUARY TO APRIL, 1878, BY WM. H. BREWER. ✓

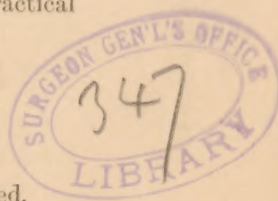
(This Synopsis of Topics, numbered in the order of their treatment, is printed
for the convenience of the class.)

I. INTRODUCTION.

1. The breeding and rearing of animals the most universal of vocations and fancies.
2. The two great ends of Modern Agriculture are the production of animals and the production of crops.
3. The part that Domestic Animals play in Modern Agriculture.
4. Breeding as an Art is very ancient.
5. The intelligent application of scientific theories and biological laws to breeding is wholly modern.
6. This course of lectures relates to the principles which underlie the modern art.
7. Qualifications necessary for high success as a practical stock breeder.
8. Definition of Domestic Animals.
9. Wherein they differ from merely tamed ones.
10. The nature and function of Instincts.
11. What characters domestication necessarily implies.
12. Most animals can be tamed ; but few are domesticated.

Classification of Domestic Animals.

13. Those bred for fancy, or as pets and companions of man.
14. Those bred for their products.
15. Those bred for their flesh.
16. Beasts of burden.



17. Those bred for man's games and sports.
18. Those bred for various other purposes.
19. Profit and Fancy are the incentives.
20. Certain general laws apply in breeding all these classes.
21. Relations to the Human Race.
22. Some Technical Terms defined.
23. A rapid sketch of the main parts of our subject.

II. HEREDITY.

24. Definition.
25. Relations to species, races, breeds and tribes.
26. Heredity of individual peculiarities.
27. Potency and "Prepotency."
28. Some causes which modify the force of heredity.
29. What characters are most often transmitted by heredity.
30. Heredity of bad points as well as good ones.
31. Practical relations of heredity to antiquity of race.
32. Practical relations to purity of breed.
33. Heredity of diseases.
34. Mutilation usually not hereditary unless disease results.
35. Heredity of acquired characters.
36. Relations to Education, Training and Instinct.
37. Some relations of Heredity to social problems in human society.
38. "Constitution," what it is.
39. Atavism, or Reversion.

III. VARIATION.

40. Variation is as universal as heredity, but less in degree.
41. Plasticity, or the capability of being moulded.
42. Variations resulting from the character and relative abundance of food and drink;—nutrition.
43. Variations induced by climate and exposure.
44. Variations induced by soil and topography.
45. By natural enemies, animal and vegetable.
46. Regional influences.
47. Variations which may be reasonably predicted from known conditions, that is, from the "*environment*."
48. These usually slight in a single generation, but often very important to the breeder.
49. By man's protection, care and training.

- 50. Variations resulting from causes or conditions as yet unknown, "*spontaneity*."
- 51. These may be either slight or great in a single generation.
- 52. The appearance of new characters.
- 53. The sudden and wide variation known as "*sporting*."
- 54. Alleged sporting often merely atavism.
- 55. Variation often accompanies crossing.

IV. SOME RELATIONS OF HEREDITY TO VARIATION.

- 56. Some of the characters acquired by the parent through variation, are usually transmitted to the offspring.
- 57. All of them occurring in any individual are never absolutely and entirely transmitted, hence perpetual variety.
- 58. The special peculiarities of sports are often practically transmitted entire if transmitted at all.
- 59. New breeds of Domestic Animals rarely originate in sports.
- 60. New varieties of cultivated plants often so originate.
- 61. Theory of the immutability of species.
- 62. Limitation of variation according to this theory.
- 63. Theory of the mutability of species.
- 64. Relations of variation to this theory.
- 65. Hypotheses relating to variation.

V. BREEDS AND PEDIGREES.

- 66. The nature of breeds, races, varieties and tribes.
- 67. Thoroughbreds, Grades, Cross-breeds, Hybrids, "Mongrels," "Natives," "Scrubs," &c., defined.
- 68. Pedigrees.
- 69. Stud-books, Herd-books, Registers and Records,—their character and uses.

VI. CLOSE BREEDING.

- 70. Relations of purity of breed to special excellencies, and to success in practical Stock-breeding.
- 71. Bakewell's experiments and experience.
- 72. The Collins' Brothers and their Shorthorns.
- 73. Breeding "In-and-in,"—definition.
- 74. Illustration from certain Shorthorn pedigrees.
- 75. Ditto,—from Setter dog pedigrees.
- 76. Relations to atavism.

- 77. Alleged advantages for "fixing characters."
- 78. For increasing family force of "prepotency."
- 79. For "concentration of blood."
- 80. For uniformity of type.
- 81. For augmenting excellencies.
- 82. Other alleged advantages and uses.
- 83. Limitations and dangers.
- 84. Alleged effects on constitutional and sexual vigor.
- 85. These alleged effects very unequally developed in different breeds.
- 86. Suggestions from Nature.
- 87. Relations to certain sanitary problems in human society.
- 88. Breeding "in line."

VII. CROSSING.

- 89. Various uses of the term.
- 90. Relations of out-crossing to health, vigor, constitution and fertility.
- 91. "Nicking."
- 92. Conflicting hypotheses as to breeding between like parents and unlike parents.
- 93. Hybrids, their characters.
- 94. Violent crossing;—its relations to health, vigor and fertility.
- 95. Relations of crossing to atavism and to spontaneous variation.
- 96. Relations to mental character, temper and disposition.
- 97. Instability of grades and cross-breeds.
- 98. "Mongrels," "Natives," &c., again noticed.
- 99. French experiments with sheep.
- 100. Facts concerning crossing the human races.
(*Crossing for other special ends will be discussed later.*)

VIII. BREEDING TO POINTS.

- 101. Breeding to Points;—definition.
- 102. The geometrical ratio of increase among animals makes a wide range of selection possible.
- 103. The improvement of breeds by the selection of parents having valuable points.
- 104. "Weeding."
- 105. Whatever may be the origin of breeds, this is the universal method of improvement.
- 106. Points and "Scales of Points."
- 107. "Ideal Types."

Illustrations from Swine.

- 108. The Wild Boar.
- 109. How changed to the Domestic Hog.
- 110. What changes in structure have followed.
- 111. What changes in instincts and habits.
- 112. Modern improved breeds.

Illustrations from the Race Horse.

- 113. The horse of antiquity.
- 114. The English Horse of the Middle Ages.
- 115. The horses of Modern Arabia, Turkey and Barbary.
- 116. The English Thoroughbred.
- 117. Horse Racing.
- 118. Stakes and prizes won in races have been the strongest special incentive to improvement.
- 119. Magnitude of the winnings of some successful horses.
- 120. Character of the competition.
- 121. Nature of the problems involved in breeding Race Horses.
- 122. Character of the changes believed to have been made.
- 123. Record of mile races and mile heats.
- 124. Record of two and four mile races and heats.
- 125. The limit of speed is perhaps nearly reached.
- 126. Number of horses with records near the best.
- 127. Value of these illustrations because we have so full a history.
- 128. Other benefits than speed that have been incidental to this progress.

Illustrations from Trotters.

- 129. The history of American Trotters.
- 130. The records of increase of speed since 1830, to illustrate the principle.
- 131. Further illustrated by the large number of 2.30 trotters.
- 132. Anatomical, physiological, psychical and mechanical problems involved in this improvement.
- 133. Relations to heredity, training and care.
- 134. Russian Trotters.

Illustrations from other Breeds of Horses.

- 135. Roadsters.
- 136. Draught horses.

- 137. Ponies.
- 138. Indian horses; mustangs; half wild horses.
- 139. Regional influences on horses; horses of mountains; horses of islands.
- 140. Special points that are independent of breeds.

Illustrations from various Breeds of Cattle.

- 141. Breeds for beef.
- 142. For milk, cream, butter and cheese.
- 143. For other special uses or special conditions.

Illustrations from Sheep.

- 144. The species only known in the domestic breeds.
- 145. Great number and variety of breeds.
- 146. Breeds for combing-wools.
- 147. For felting-wools.
- 148. For special classes of fabrics.
- 149. For mutton.
- 150. For milk, butter and cheese.
- 151. Breeds used in semi-barbarous countries.
- 152. Some political and speculative phases of sheep-breeding.

Illustrations from Dogs.

- 153. The great number of breeds.
- 154. The wonderful variety of characters produced by breeders and fanciers.
- 155. How size, form, structure and color have been modied.
- 156. How natural instincts have been changed and artificial instincts formed.

Illustrations from various species.

- 157. Goats.
- 158. Rabbits.
- 159. Fowls, Turkeys, Geese, &c.
- 160. Pigeons.
- 161. Canary birds.
- 162. Illustrations from other species bred for pets or fancy.
- 163. Certain general biological laws underlie and control all the phases of breeding above mentioned.
- 164. But the details of the breeders' art vary very widely in actual practice with different species and breeds.

165. Disposition, temper and artificial instincts as points to be bred for.
166. Bad points may be as surely bred to as good ones.
167. Too much attention often paid to fancy points and "style" in breeding animals of utility.
168. Relations of breeding to points, to pedigree.
169. Selection and weeding not to be neglected because of pedigree.
170. The element of time necessary for the changes and improvements described.
171. Antiquity of some breeds.
172. Relation of this section to human races and tribes.
173. Relation to "Natural selection."

IX. LIMITATIONS OF BREEDING TO POINTS.

174. Improvement cannot be continued indefinitely in any one direction.
175. Correlations of growth.
176. Explanation of how certain defects are parallel to and increase with improvements.
177. Illustrations where such correlations are from obvious causes or obvious dependence.
178. From sheep,—relations between character of the wool and the flesh,—between the fineness of the fibre and hardness.
179. From horses,—form and strength,—texture of bone and speed.
180. Illustrations from Poultry.
181. Other illustrations and examples.
182. Correlation where the cause of the dependence is not obvious.
183. "Signs" of qualities.

X. ANTENATAL INFLUENCES.

184. Conception, Embryology and Gestation.
185. Influence of fright, fear, etc., in the dam on the offspring.
186. Other facts and phenomena,—“Imagination.”
187. Influence of the first offspring on the dam.
188. Attempts to control the production of the sexes.
189. At what age should animals breed?
190. Various influences which modify conception and fertility.
191. Deformities and Monstrosities.

XI. RELATIVE INFLUENCE OF SIRE AND DAM.

192. Their relative influence on the improvement of a herd, or on the stock of a district.
193. The sire most potent in such improvement in all polygamous breeds.
194. Their relative influence on the individual offspring.
195. Various hypotheses and theories that have been proposed.
196. The theory of Linnæus.
197. Its revival and extension by Orton.
198. Application of these theories.
199. Influence of the relative size of sire and dam.
200. Influence of the relative age of sire and dam.

XII. CROSSING FOR SPECIAL USES.

201. The nature of grades and cross-breeds considered in respect to individual excellence for special uses.
202. Crossing cattle for beef, draught, milk, etc.
203. Crossing sheep for special demands of the market.
204. Crossing horses for various immediate special results.
205. Other crosses for special uses.
206. The production of thoroughbreds to be used in making such grades and cross-breeds.

XIII. PROFITABLE ADAPTATION OF BREEDS TO LOCALITIES AND CONDITIONS.

207. The local origin of breeds.
208. Why breeds that are profitable in one place are often unprofitable in another.
209. The most improved breeds are very artificial productions which have been specially bred and adapted to particular conditions and uses.
210. Their technical superiority only kept up by good breeding and special care.
211. Hence the relation of breeds to the habits and skill of the owner, as well as to the natural and economical conditions of the locality.
212. There is no "*horse for all work*," nor is there among other animals any breed best for all uses.
213. The highest profit is reached only when special breeds for special purposes are used.
214. Each region must determine for itself by the experiment of actual use what breeds are most profitable for it to produce.

